

WASHINGTON

SCIENCE TRENDS

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Nuclear Energy Developments

Atomic Energy Commission, as expected, is veering away from its fluid fuel reactor programs for power production in favor of thermal breeder reactor concepts. At the same time, the Commission has given new support to a nuclear superheat development program.

- * Fluid Fuel Reactors -- Commission is suspending its research and development on a liquid sodium-cooled, heavy water-moderated nuclear power reactor concept, originally planned for a power reactor at Anchorage, Alaska. Last February the AEC decided that it would "not be sound" to build a reactor that was "not proven" at a remote utility site.

Subsequently, a Commission study group concluded that "even if the technical problems were successfully solved, the cost of power produced by the system as presently understood would not be lower than that produced by other natural uranium power reactor systems."

While R&D on this concept is suspended, work will continue separately on sodium technology and on heavy water technology as applied to other power reactor concepts. At a later date, the sodium heavy water concept will be re-evaluated. Work on other fluid fuel systems will also be "phased out" as an approach to economic power production. At the same time, more effort is expected to be put forth on reactors that can use available world supplies of thorium to produce power and breed supplies of U-233.

- * Nuclear Superheat Reactors -- New contracts with Combustion Engineering-General Nuclear Engineering Corp., Windsor, Conn., and General Electric Co. San Jose, Calif. brighten the outlook for a realistic appraisal of nuclear superheated (dry) steam for power reactors.

Dry steam is obtained by circulating saturated steam through a nuclear heat source to increase its temperature as it goes to the turbine. Advocates of this system say it may make possible reductions in capital and fuel costs of nuclear power plants due to a higher steam temperature, a simplified turbine and associated equipment and a reduction in fuel burn-up.

The Combustion Engineering contract will be evaluated by the end of the year to determine whether a prototype plant is feasible. GE will work primarily on separate superheaters and associated problems.

Automatic Data Processing -- U.S. Government

The Federal Government, according to new estimates, has installed over 175 electronic data processing systems, with annual rental costs of over \$50 million. The statistics compare with 121 systems installed with a \$20 million annual rental 1½ years ago. The increase, and inevitable future changes, leads to official concern over costs and proper planning.

Integrated Planning -- Officials of the General Accounting Office have told Congress they are concerned over the "general trend...to use electronic computers in segments of agency operations rather than in systems in which management procedures and controls over related functional areas are fully integrated.

"We believe it extremely important," says Edward J. Mahoney, Asst. Director of Accounting and Auditing Policy "to emphasize the basic need for fully studying the possibilities of integration before decisions are made. Direct conversions for existing systems to electronic methods alone seldom produce significant savings except on single purpose specialized systems involving great masses of data. Some direct conversions may even result in additional costs if extensive, detailed systems redesign and reprogramming are required when the possibilities of integration are later developed."

Automatic Data Interchange -- Officials see "large potential savings" in proposals for interchange of taped data between industry and the Federal Government. Under this plan, automatic transcription and subsequent automatic processing of Government-Industry transactions would be carried on through the use of magnetic tapes. To date, a small number of firms report taped wage records to the Social Security Administration. Arrangements have also been made for exchange of data on magnetic tapes between the Department of Defense and several private firms.

Widespread use of tape, it is said, would eliminate the need for manual transcription of detailed records, with correspondingly fewer errors and lower transcription costs.

Intra-Government Planning -- Steps are being taken to coordinate electronic processing between Government Agencies. A system to be installed in Chicago, Ill. during 1960 is planned by the Veteran's Administration, the Treasury Department and the Post Office Department for the issuance of veteran's benefits checks.

Under this plan, check-payment data produced in the veterans' benefit electronic system will provide data in machine processable form to the Treasury Department electronics center, which is also to be installed in Chicago. The Treasury Electronic system will automatically produce Government checks for Veteran's Administration payees. In turn, the Treasury electronic system will presort the checks so that they can be turned over to the Post Office Department coded for destinations. The system is expected to eventually handle roughly 100 million checks per year, about one-fourth the volume of all Government checks.

At a later date, the magnetic tapes produced in the checkwriting process will be used to automatically record individual check-disbursement data in the Treasury electronic banking system in Washington. This system controls payment and check-reconciliation operations for all U.S. Treasury checks.

(Report Available -- See The Publication Checklist)

The MgO Cold Cathode -- A New Electron Source

U.S. Army Signal R&D Laboratory is continuing to investigate the MgO Cold Cathode, a new electron source which renders electron emission in a vacuum at moderate collector voltages without the use of a heater. A number of commercial and military applications are foreseen in a new report prepared for Army Scientists by Dietrich Dobischek of the Laboratory.

Advantages of the system over standard thermionic cathodes are said to include:

- * Elimination of an external heat source with its inevitable heat losses, resulting in less power requirements.
- * Elimination of the power supply needed for the heating of a thermionic cathode, thereby saving weight and space.
- * Elimination of the hot cathode heater filament, said to be the greatest single element in tube reliability and useful life.
- * Elimination of the continuous evaporation of the hot cathode coatings, which takes place during the operation of the thermionic cathode and eventually terminates the life of the cathode.
- * Elimination of the time delay for warm-up. Since the MgO cathode, when triggered, is ready for immediate use, it is said to be superior to the thermionic cathode in applications requiring "press to talk" or "immediate fire" readiness.

Applications for the MgO cold cathode are still being investigated at USASRDL and under industrial contract. An audio output amplifier tube was successfully demonstrated and a model of a preamplifier tube using the principle of secondary emission multiplication has been built to demonstrate the feasibility in combination with the MgO cold cathode.

Objective of this study is a complete line of tubes for a table radio which will play as soon as it is turned on, and in which the tube may even outlast the radio itself. Industrial studies, by Tung-Sol Electric, Inc. include a cathode ray gun for use in cathode ray tubes, klystrons, traveling-waves tubes and similar equipment. Other applications are said to include electronic computers, industrial automation and control circuits, underwater telephone cable repeaters and in earth satellites and similar equipment.

Basic Research is proceeding to obtain better insight into the mechanism of the self-sustained emission from MgO. It is hoped that this in turn, will aid in making the best use of the MgO cold cathode, and possibly lead the way to materials "even more suitable" for displaying a self-sustained emission effect.

Theory now assumes that electrons liberated within the MgO by internal ionization enter the pores of MgO coatings. There they travel with long mean free paths, and under the influence of the high electrical field existing across the layers, gain sufficient energy to cause further ionization when they strike the surface of the MgO inside the pores. Eventually, an electron avalanche ensues. The tentative assumption is that the liberation of the electrons which initiate the avalanche is the result of a photoelectric effect in which photons are ejected during the recombination of positive ions with electrons.

RESEARCH CHECKLIST

- () Missile Guidance Research: Navy researchers have developed a new negative-pulse amplifier circuit for use in crystal video receiver design. The receiver is expected to permit considerable security against enemy countermeasures even when using the simplest of missile guidance systems. The crystal video receiver is said to have inherently small size, low cost and simplified operational usage in comparison with superheterodyne receivers.

(R&D by Radar Division, Equipment Research Branch, Problem No: R05-04, Naval Research Laboratory, Washington 25, D.C.)

- () Flight Photography: The Air Force F-106 jet interceptor is being equipped with a new 35mm motion picture camera to photograph targets and flight paths of air-launched missiles. A fixed six-inch focal-length lens is said to give unusually high resolution in a wide frame. The device can cover a 54-degree horizontal sector, photographing 15-foot objects nearly six miles ahead of the aircraft. Illuminated reference marks permit data analysis of film taken during night missions.

(R&D by Convair, San Diego and Benson-Lehner, Los Angeles,

- () Chemical Evaporation Reduction: Studies by the U.S. Interior Department and other agencies indicate the feasibility of reducing evaporation on large reservoirs by the application of a monomolecular "chemical shield." In tests, a dry powder form of hexadecanol was used at Lake Hefner, Oklahoma. Savings of nine percent in water losses from evaporation were achieved. This is said to be about one-fourth the potential savings under more favorable conditions.

(Further details available. Free. Write Information Service, U.S. Department of the Interior, Washington 25, D.C. for P.N. 57462-59)

- () Infrared Research: Research at New York U. sponsored by the Navy has led to development of a method of utilizing zinc cadmium sulfide phosphor plates to record infrared radiation of wavelengths as long as 2.5 microns. Latent infrared images were obtained and could be stored as long as several weeks before development. A large number of inorganic phosphors are said to be useful in this method.

(Report available. 8 pages. 50 cents. Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 179)

- () Radiation Dosimeters: Army research has led to experimental models of a new tactical fast neutron dosimeter known as a secondary electron mixed-radiation dosimeter or SEMIRAD. The unit has the same general appearance as ion chambers. However, unlike ion chambers which are filled with air or other gas, SEMIRAD is evacuated to a very low pressure. Tests indicate that the system can be applied successfully in practical dosimetry, particularly where high dose rates are involved.

(R&D by U.S. Army Signal R&D Laboratory, Ft. Monmouth, N.J.)

- () Printed Cable Research: Studies at the U.S. Army Ballistic Missile Agency, have led to the conclusion that a new cable and connector concept is suitable for volume production. The technique is designed to replace conventional wire harnesses and to facilitate and expedite complex cabling typical of guided missiles, airplanes, telephone exchanges and similar equipment. Flat conductors are said to lend themselves to direct surface pressure connection, eliminating all solder, crimp or twist junctions.

(Report by W. Angele, U.S. ABMA, Redstone Arsenal, Alabama)

- () New Computer Application: Navy researchers have written a twelve-track program which performs great circle calculations required in connection with direction-finding radio propagation and navigation problems. A small, general-purpose digital computer is used. The program is said to be characterized by simplified input and concise, unambiguous output.

(R&D by Radio Division, Naval Research Laboratory, Washington 25, D.C. Problem No. R07-12)

- () Tube Clarity Tester: AEC-Sponsored Research at Goodyear Atomic Corp., Portsmouth, Ohio, has led to development of a simple instrument to measure the resistance to flow in Freon evaporator tubes which become plugged because of foreign matter contained in the Freon system. The resulting Tube Clarity Tester has operated satisfactorily in field use.

(Report available. 10 pages. 50 cents. Write OTS, U.S. Department of Commerce, Washington 25, D.C. for GAT -T- 648)

- () Radar Refraction: Studies at the White Sands Missile Range, New Mexico indicates that at low elevation angles refractions in the atmosphere can cause serious errors in observed radar angles and ranges. Corrective systems presently employed are said to be complex and time-consuming. A radar beacon correction system has been shown to be advantageous for most landlocked radar tracking sites in test areas.

(R&D by Missile Geophysics Division, U.S. Army Signal Missile Support Agency, White Sands Missile Range, New Mexico)

- () Vacuum Analysis Systems: A new magnetically operated cutoff valve is said to improve the control and accuracy of vacuum analysis systems used in the extraction and analysis of small amounts of gas from metals. The device is also said to permit programming to be set up for an analysis cycle and controlled remotely to meet the demands of hot cell operations.

(R&D by Metallurgy Division, Analytical Chemistry Branch, Naval Research Laboratory, Washington 25, D.C. Problem No. M01-01)

Publication Checklist

- () Space Agency, the most complete report yet published on plans, programs and policies of the National Aeronautics and Space Administration. Well-illustrated. A valuable guide to research in a number of associated fields. 678 pages. Single copies free, as available. (Write Committee on Aeronautical and Space Sciences, Senate Office Building, Washington 25, D.C. for Hearings, Part I, NASA Authorizations for FY 1960)
- () Military Construction, testimony by Army and Navy on military construction projects planned for the next year. Includes some information on plans for the Pacific Missile Range, various laboratories and R&D installations. Testimony taken in closed sessions and now released. 918 pages. Single copies free, as available. (Write Committee on Appropriations, House of Representatives, The Capitol, Washington 25, D.C. for Hearings, Military Construction)
- () Space Propulsion, comprehensive testimony by a number of leading military and industrial experts on the entire field of rockets and space propulsion, including advanced space concepts. An excellent guide to fundamentals as well as future programs. 307 pages. Single copies free, as available. (Write Committee on Science and Astronautics, New House Office Building, Washington 25, D.C. for Hearings, Space Propulsion)
- () AEC Programs, the complete text of unclassified testimony and statements on the plans, programs and policies of the Atomic Energy Commission for the coming year. 698 pages. Single copies free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D.C. for Hearings, AEC Authorizing Legislation, FY 1960)
- () IGY Bulletin, publication of this monthly bulletin on the International Geophysical Year has been extended for one year from July, 1959 to June, 1960. Subscriptions for the additional year are \$2. Subscriptions for the entire set of 36 issues and special rates for students and educators are available. (Write Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, Washington 25, D.C.)
- () Data Processing, testimony, statements and exhibits on the use of electronic data processing equipment by the Federal Government. Includes information on costs, applications and related material. 142 pages. Single copies free. (Write Committee on Post Office and Civil Service, House Office Building, Washington 25, D.C. for Hearings, Use of Electronic Data-Processing)
- () Heat and Mass Transfer, a bibliography and selected abstracts of literature dealing with the general problem of heat and mass transfer. 172 pages. \$3. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 517)
- () Zirconia, a report indicating that in addition to being among the most stable of the refractory oxides, zirconia has other qualities which recommend its use in rocket, ramjet and missile applications. A study also indicates that the usefulness of zirconia is now dependent on controlling its crystallographic transformation. 26 pages. 75 cents. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 665)

